

WHAT IS CLAIMED IS:

1. A system for controlling and distributing electrical energy in a vehicle electrical system, comprising:

a generator ;

an electrical load;

a stored energy source; and

a control device connected to and in communication with the vehicle electrical system, generator, electrical load, and stored energy source;

said control device monitoring electrical signals generated by the generator, electrical load, and stored energy source, and processing the electrical signals to ascertain certain electrical signatures, and selectively connecting or disconnecting the generator, electrical load, or stored energy source, or any combination thereof, with the vehicle electrical system when said electrical signatures have been verified.

2. The system of claim 1, wherein the control device further comprises means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and stored energy source in the vehicle electrical system.

3. The system of claim 2, wherein the means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and stored energy source in the vehicle electrical system comprises:

(a) a processor capable of recording temporal records of said signals;

and

(b) sensors capable of measuring and transmitting voltage and current signals from said generator, electrical load, and stored energy source in the vehicle electrical system to the processor.

4. The system of claim 1, wherein the control device comprises means for selectively connecting or disconnecting a generator or stored energy source with a vehicle electrical system comprising:

to disconnect the generator or stored energy source from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or ignition signal indicates a non-operating vehicle engine;

to inhibit said disconnection of the generator or stored energy source from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical; and

to connect the generator or stored energy source to the vehicle electrical system when an energize signal from an energize line associated with the generator has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

5. The system of claim 1, wherein the control device comprises means for selectively connecting or disconnecting an electrical load from the vehicle electrical system comprising:

to disconnect the electrical load when a current drawn by said load exceeds a prescribed threshold; and

to connect said load when an ignition signal associated with the generator has been determined to indicate an operating vehicle electrical system when it follows the absence of the ignition signal.

6. The system of claim 4, wherein the means for selectively connecting or disconnecting a generator or stored energy source comprises a bi-directional semiconductor switch module.

7. The system of claim 5, wherein the means for selectively connecting or disconnecting an electrical load comprises integrated circuit modules with built-in logic to limit the current drawn by said load.

8. The system of claim 1, further comprising means for generating a status signal in response to connection or disconnection of a generator, electrical load, or stored energy source with the vehicle electrical system.

9. The system of claim 8, wherein the means for generating a status signal comprises a flashing visual indicator.

10. A system for controlling and distributing electrical energy in a vehicle electrical system, comprising:

means for generating electrical energy ;

an electrical load;

means for storing energy; and

means for controlling said means for generating electrical energy, electrical load, and means for storing energy, by monitoring electrical signals generated by said means for generating electrical energy, electrical load, and means for storing energy, and processing said electrical signals to ascertain certain electrical signatures, and selectively connecting or disconnecting said means for generating electrical energy, electrical load, and means for storing energy, or any combination thereof, with the vehicle electrical system when said electrical signatures have been verified.

11. The system of claim 10, wherein the means for controlling the means for generating electrical energy, electrical load, and means for storing energy further comprises a sensor that detects a frequency and amplitude of said electrical signals.

12. The system of claim 11, wherein the sensor comprises:

(a) a processor capable of recording temporal records of said signals;
and

(b) means for measuring and transmitting voltage and current signals from said means for generating electrical energy, electrical load, and means for storing energy in the vehicle electrical system to the processor.

13. The system of claim 10, wherein the means for controlling the means for generating electrical energy, electrical load, and means for storing energy further comprises a bi-directional semiconductor switch module:

to disconnect the means for generating electrical energy or means for storing energy from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the means for generating electrical energy have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or ignition signal indicates a non-operating vehicle engine;

to inhibit said disconnection of the means for generating electrical energy or means for storing energy from the vehicle electrical system when a current flow associated with the means for storing energy has been determined to be cyclical;
and

to connect the means for generating electrical energy or means for storing energy to the vehicle electrical system when an energize signal from an energize line associated with the means for generating electrical energy has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

14. The system of claim 10, wherein the means for controlling the means for generating electrical energy, electrical load, and means for storing energy comprises integrated circuit modules with built-in logic:

to disconnect the electrical load when a current drawn by said load

exceeds a prescribed threshold; and

to connect said load when an ignition signal associated with the means for generating electrical energy has been determined to indicate an operating vehicle electrical system when it follows the absence of the ignition signal.

15. A system for controlling and distributing electrical energy from a generator in a vehicle electrical system, comprising:

an electrical load;

a stored energy source; and

a control device connected to and in communication with the vehicle electrical system, generator, electrical load, and stored energy source;

said control device monitoring electrical signals generated by the generator, electrical load, and stored energy source, and processing the electrical signals to ascertain certain electrical signatures, and transferring electrical energy available from the generator to the electrical load or stored energy source, or any combination thereof, when said electrical signatures have been verified.

16. The system of claim 15, wherein the control device further comprises means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and stored energy source in the vehicle electrical system.

17. The system of claim 16, wherein the means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and stored energy source in the vehicle electrical system comprises:

(a) a processor capable of recording temporal records of said signals;

and

(b) sensors capable of measuring and transmitting voltage and current signals from said generator, electrical load, and stored energy source in the vehicle electrical system to the processor.

18. The system of claim 15, wherein the control device comprises means for transferring electrical energy available from the generator to the electrical load or stored energy source comprising:

to disconnect the generator from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or ignition signal indicates a non-operating vehicle engine;

to inhibit said disconnection of the generator from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical; and

to connect the generator to the vehicle electrical system when an energize signal from an energize line associated with the generator has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

19. The system of claim 18, wherein the means for transferring electrical energy available from the generator to the electrical load or stored energy source comprises a bi-directional semiconductor switch module, wherein said bi-directional semiconductor switch module is controllably turned on or off facilitating said energy transfer from said generator.

20. A system for controlling and distributing electrical energy from a stored energy source in a vehicle electrical system, comprising:

a generator;

an electrical load; and

a control device connected to and in communication with the vehicle electrical system, generator, electrical load, and stored energy source;

said control device monitoring electrical signals generated by the

generator, electrical load, and stored energy source, and processing the electrical signals to ascertain certain electrical signatures, and transferring electrical energy available from the stored energy source to the generator or electrical load, or any combination thereof, when said electrical signatures have been verified.

21. The system of claim 20, wherein the control device further comprises means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and stored energy source in the vehicle electrical system.

22. The system of claim 21, wherein the means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and stored energy source in the vehicle electrical system comprises:

(a) a processor capable of recording temporal records of said signals;
and

(b) sensors capable of measuring and transmitting voltage and current signals from said generator, electrical load, and stored energy source in the vehicle electrical system to the processor.

23. The system of claim 20, wherein the control device comprises means for transferring electrical energy available from the stored energy source to the generator or electrical load comprising:

to disconnect the stored energy source from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or ignition signal indicates a non-operating vehicle engine;

to inhibit said disconnection of the stored energy source from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical; and

to connect the stored energy source to the vehicle electrical system when an energize signal from an energize line associated with the generator has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

24. The system of claim 23, wherein the means for transferring electrical energy available from the stored energy source to the generator or electrical load comprises a bi-directional semiconductor switch module, wherein said bi-directional semiconductor switch module is controllably turned on or off facilitating said energy transfer from said stored energy source.

25. A system for controlling and distributing electrical energy through an electrical load in a vehicle electrical system, comprising:

a generator;

a stored energy source; and

a control device connected to and in communication with the vehicle electrical system, generator, electrical load, and stored energy source;

said control device monitoring electrical signals generated by the generator, electrical load, and stored energy source, and processing the electrical signals to ascertain certain electrical signatures, and transferring electrical energy available from the generator or stored energy source, or any combination thereof, to the electrical load when said electrical signatures have been verified.

26. The system of claim 25, wherein the control device further comprises means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and stored energy source in the vehicle electrical system.

27. The system of claim 26, wherein the means for sensing a frequency and amplitude of the electrical signals generated by said generator, electrical load, and

stored energy source in the vehicle electrical system comprises:

- (a) a processor capable of recording temporal records of said signals;
- and
- (b) sensors capable of measuring and transmitting voltage and current signals from said generator, electrical load, and stored energy source in the vehicle electrical system to the processor.

28. The system of claim 25, wherein the control device comprises means for transferring electrical energy available from the generator or stored energy source to the electrical load comprising:

- to disconnect the electrical load when a current drawn by said load exceeds a prescribed threshold; and
- to connect said load when an ignition signal associated with the generator has been determined to indicate an operating vehicle electrical system when it follows the absence of the ignition signal.

29. The system of claim 28, wherein the means for transferring electrical energy available from the generator or stored energy source to the electrical load comprises integrated circuit modules with built-in logic to limit the current drawn by said load.

30. A control device for controlling and distributing electrical energy in a vehicle electrical system, comprising:

- a processor;
- a sensor that detects electrical signals generated by a generator, electrical load, and stored energy source in the vehicle electrical system;
- a switching system for the generator, electrical load, and stored energy source; and
- programming code operable on the processor to process said electrical signals to ascertain certain electrical signatures, and to connect or disconnect

selectively through the switching system said generator, electrical load, and stored energy source, or any combination thereof, with the vehicle electrical system when said electrical signatures have been verified.

31. The control device of claim 30, further comprising a sensor that detects a frequency and amplitude of an output voltage, energize signal, alternating current, and ignition signal, associated with the generator.

32. The control device of claim 30, further comprising a sensor that detects a frequency and amplitude of an output voltage and current of an auxiliary-port.

33. The control device of claim 30, further comprising a sensor that detects a frequency and amplitude of a current flow into the stored energy source.

34. The control device of claim 30, further comprising a sensor that detects a frequency and amplitude of a current flow out of the stored energy source.

35. The control device of claim 30, wherein the program code operable on the processor instructs the switching system to connect or disconnect selectively a generator or stored energy source with a vehicle electrical system comprising:

to disconnect the generator or stored energy source from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or ignition signal indicates a non-operating vehicle engine;

to inhibit said disconnection of the generator or stored energy source from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical; and

to connect the generator or stored energy source to the vehicle electrical system when an energize signal from an energize line associated with the generator

has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

36. The control device of claim 30, wherein the program code operable on the processor instructs the switching system to connect or disconnect selectively an electrical load with a vehicle electrical system comprising:

to disconnect the electrical load when a current drawn by said load exceeds a prescribed threshold; and

to connect said load when an ignition signal associated with the generator has been determined to indicate an operating vehicle electrical system when it follows the absence of the ignition signal.

37. The control device of claim 35, wherein the switching system further comprises a bi-directional semiconductor switch module.

38. The control device of claim 36, wherein the switching system further comprises integrated circuit modules with built-in logic to limit the current drawn by said load.

39. The control device of claim 30, further comprising means for generating a status signal in response to connection or disconnection of a generator, electrical load, or stored energy source.

40. The control device of claim 39, wherein the means for generating a status signal comprises a flashing visual indicator.

41. A control device for controlling and distributing electrical energy in a vehicle electrical system, comprising:

means for sensing electrical signals generated by a generator, electrical load, and stored energy source in the vehicle electrical system;

means for switching the generator, electrical load, and stored energy source; and

means for processing said electrical signals;

said means for processing ascertains certain electrical signatures and selectively connects or disconnects said generator, electrical load, or stored energy source, or any combination thereof, via said means for switching, when said electrical signatures have been verified.

42. The control device of claim 41, wherein the means for processing causes said means for switching to connect or disconnect selectively a generator or stored energy source with a vehicle electrical system comprising:

to disconnect the generator or stored energy source from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or ignition signal indicates a non-operating vehicle engine;

to inhibit said disconnection of the generator or stored energy source from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical; and

to connect the generator or stored energy source to the vehicle electrical system when an energize signal from an energize line associated with the generator has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

43. The control device of claim 41, wherein the means for processing causes said means for switching to connect or disconnect selectively an electrical load with a vehicle electrical system comprising:

to disconnect the electrical load when a current drawn by said load

exceeds a prescribed threshold; and

to connect said load when an ignition signal associated with the generator has been determined to indicate an operating vehicle electrical system when it follows the absence of the ignition signal.

44. A method for controlling and distributing electrical energy in a vehicle electrical system, the method comprising:

(a) monitoring electrical signals generated by a generator, electrical load, and stored energy source in the vehicle electrical system;

(b) processing the electrical signals to ascertain certain electrical signatures; and

(c) selectively connecting or disconnecting the generator, electrical load, or stored energy source, or any combination thereof, with the vehicle electrical system when said electrical signatures have been verified.

45. The method of claim 44, wherein (a) comprises sensing a frequency of electrical signals generated by said generator, electrical load, or stored energy source in the vehicle electrical system.

46. The method of claim 44, wherein (a) comprises sensing an amplitude of electrical signals generated by said generator, electrical load, or stored energy source in the vehicle electrical system.

47. The method of claim 44, wherein (b) comprises quantifying electrical signals received from a generator, electrical load, or stored energy source in the vehicle electrical system, and comparing them with a pre-determined value.

48. The method of claim 47, wherein the step of quantifying comprises measuring a frequency of said electrical signals received from said generator, electrical load, or stored energy source in the vehicle electrical system.

49. The method of claim 47, wherein the step of quantifying comprises measuring an amplitude of said electrical signals received from said generator, electrical load, or stored energy source in the vehicle electrical system.

50. The method of claim 44, wherein (c) comprises disconnecting the generator or stored energy source from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or ignition signal indicates a non-operating vehicle engine, and further inhibiting said disconnection of the generator or stored energy source from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical, and further connecting the generator or stored energy source to the vehicle electrical system when an energize signal from an energize line associated with the generator has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

51. The method of claim 44, wherein (c) comprises disconnecting the electrical load when a current drawn by said load exceeds a prescribed threshold, and further connecting said load when an ignition signal associated with the generator has been determined to indicate an operating vehicle electrical system when it follows the absence of the ignition signal.

52. A method for controlling and distributing electrical energy from a generator in a vehicle electrical system, the method comprising:

- (a) monitoring electrical signals generated by the generator, electrical load, and stored energy source in the vehicle electrical system;
- (b) processing said signals to ascertain certain electrical signatures; and
- (c) transferring electrical energy available from the generator to the

electrical load or stored energy source when said electrical signatures have been verified.

53. The method of claim 52, wherein (a) comprises sensing a frequency and amplitude of the electrical signals generated by the generator, electrical load, or stored energy source in the vehicle electrical system.

54. The method of claim 52, wherein (b) comprises measuring a frequency and amplitude of the electrical signals generated by the generator, electrical load, or stored energy source in the vehicle electrical system, and comparing them with a pre-determined value.

55. The method of claim 52, wherein (c) comprises selectively connecting or disconnecting a generator with the vehicle electrical system.

56. The method of claim 55, further comprising disconnecting the generator from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or the ignition signal indicates a non-operating vehicle engine, and further comprising inhibiting said disconnection of the generator from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical.

57. The method of claim 55, further comprising connecting the generator to the vehicle electrical system when an energize signal associated with the generator has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

58. A method for controlling and distributing electrical energy from a

stored energy source in a vehicle electrical system, the method comprising:

- (a) monitoring electrical signals generated by the stored energy source, generator, and electrical load in the vehicle electrical system;
- (b) processing said signals to ascertain certain electrical signatures; and
- (c) transferring electrical energy available from the stored energy source to the electrical load or generator when said electrical signatures have been verified.

59. The method of claim 58, wherein (a) comprises sensing a frequency and amplitude of the electrical signals generated by the generator, electrical load, or stored energy source in the vehicle electrical system.

60. The method of claim 58, wherein (b) comprises measuring a frequency and amplitude of the electrical signals generated by the generator, electrical load, or stored energy source in the vehicle electrical system, and comparing them with a pre-determined value.

61. The method of claim 58, wherein (c) comprises selectively connecting or disconnecting a stored energy source with the vehicle electrical system.

62. The method of claim 61, further comprising disconnecting a stored energy source from the vehicle electrical system when a prescribed time delay expires and an alternating current and ignition signal associated with the generator have been determined to indicate a non-operating vehicle engine wherein the absence of either the alternating current or the ignition signal indicates a non-operating vehicle engine, and further comprising inhibiting said disconnection of the stored energy source from the vehicle electrical system when a current flow associated with the stored energy source has been determined to be cyclical.

63. The method of claim 61, further comprising connecting a stored energy

source to the vehicle electrical system when an energize signal associated with the generator has been determined to indicate an operating vehicle electrical system, wherein the existence of a voltage at the energize line indicates an operating vehicle electrical system.

64. A method for controlling and distributing electrical energy through an electrical load in a vehicle electrical system, the method comprising:

- (a) monitoring electrical signals generated by the electrical load, generator, and stored energy source in the vehicle electrical system;
- (b) processing said signals to ascertain certain electrical signatures; and
- (c) transferring electrical energy available from the generator or stored energy source to the electrical load when said electrical signatures have been verified.

65. The method of claim 64, wherein (a) comprises sensing a frequency and amplitude of the electrical signals generated by the generator, electrical loads, or stored energy source in the vehicle electrical system.

66. The method of claim 64, wherein (b) comprises measuring a frequency and amplitude of the electrical signals generated by the generator, electrical load, or stored energy source in the vehicle electrical system, and comparing them with a pre-determined value.

67. The method of claim 64, wherein (c) comprises selectively connecting or disconnecting an electrical load with the vehicle electrical system.

68. The method of claim 67, further comprising disconnecting said load from the vehicle electrical system when a current drawn by said load exceeds a prescribed threshold.

69. The method of claim 67, further comprising connecting said load to the vehicle electrical system when an ignition signal associated with the generator has

been determined to indicate an operating vehicle electrical system when it follows the absence of the ignition signal.